A NEW VARIETY OF ERIOGONUM ERICIFOLIUM (POLYGONACEAE)

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While collecting towards a flora of the New York and Providence mountains of eastern San Bernardino County, California, a small series of populations of a very low-growing buckwheat was observed on a saddle on an exposed site west of Fourth of July Canyon in the New York Mountains. Early observations of the specimens by Robert F. Thorne revealed that they were unlike any other known buckwheat from California. Observations by the senior author indicated the taxon's similarity to *Eriogonum ericifolium* Torr. & Gray, one of the rarest species in the genus. As recently noted by Reveal (1971), one variety of this species (var. *ericifolium*) is known from only two collections: the type, (Coues and Palmer in 1865 near Fort Whipple, Arizona) and a collection by Mearns in 1887 near Forte Verde, Arizona, which is the type for a synonym, *E. mearnsii*. The more common phase of the species, var. *pulchrum* (Eastw.) Reveal, has been frequently collected, especially during this century, throughout its range in northern Arizona. However, var. *ericifolium* has escaped the attention of collectors in Arizona for eighty-five years. Careful examination of the plants from the New York Mountains collection has shown that they are distinct from var. *ericifolium* insofar as we know that taxon to date. As a result, we are proposing a new variety for this California population.

Eriogonum ericifolium Torr. & Gray var. **thornei** Reveal & Henrickson, var. nov. A var. *ericifolio* foliis 4–6 mm longis, villosis supra, petiolis 1–2 mm longis cum basibus 1–2(–3) mm longis, marginibus eglandulosis, involucris 1.5–2.0 mm longis, admodum glabris, floribus 1.5–2.0 mm longis, achaenis 2 mm longis differt.

Type: California, San Bernardino Co., about 64 airline km E of Baker in the New York Mountains 10.5 airline km SSW of Ivanpah along a trail to a ridge in the western portion of Fourth of July Canyon area, on exposed rocky granitic-quartzite ridge associated with *Pinus monophylla, Juniperus osteosperma, Yucca baccata, Opuntia,* and other shrubs at about 1810 m, near 35° 15′ N, 115° 25′ W, (center of the SW ¼ of sect. 35 of R 14 E, T 15 N), 20 Aug 1973, *Henrickson 12676.* Holotype, US! Isotypes, ARIZ! CSLA! MARY! NY! RSA! SD! TEX! UC!

The new variety is named for Dr. Robert F. Thorne of Rancho Santa Ana Botanic Garden, Claremont, California.

Variety *thornei* differs from var. *ericifolium* in having villous upper leaf blades (not glabrous) on petioles 1–3 mm (not 1 mm) long, and slightly longer petiole bases that are not glandular along the margin as in var. *ericifolium*. Involucres of var. *thornei* are merely 1.5–2.0 mm long, whereas those of var. *ericifolium* are 2.5 mm long. The tube of the involucre is pubescent without in the typical variant, but in the new variety only the very apex of the tube along the margin has hairs. The flowers of var. *thornei* range from 1.5–2.0 mm long, while those of var. *ericifolium* are larger, being 2.5–3.0 mm long. So far as we can ascertain, both variants have white tepals that are slightly dissimilar in shape, with the outer tepals being somewhat wider than the inner tepals. Although we have seen only immature achenes of both varieties, those of var. *thornei* are just slightly smaller than those of var. *ericifolium*.

Based on information available to us, it seems that var. *thornei* is a highly isolated population of *Eriogonum ericifolium,* restricted to this single location. It occurs at a slightly higher elevation than var. *ericifolium* and appears to be more woody. Until var. *ericifolium* can be rediscovered, the overall relationship between it and the new variant cannot be firmly established. Nevertheless, based on gross morphological similarities of these taxa, we seriously doubt that the addition of more material will greatly affect the placement of var. *thornei*.

The key to *Eriogonum* in Munz (1968) can be altered after AA, B, CC, DD, E, FF, G, H, II, J, KK to read:

L. Infl. a compact terminal cyme; invols. tomentose or glabrous.
M. Plants low spreading subshrubs in montane places to shrubs at lower elevations, up to 10 dm high; lvs. not revolute, or if so, then plants distinctly shrubby, the blades (3)10–30 mm long; common. 74. *E. microthecum*
MM. Plants low, compact subshrubs of desert places, less than 2 dm high; lvs. revolute, the blades 4–6 mm long; New York Mts. 74a. *E. ericifolium* var. *thornei*

74a. E. ERICIFOLIUM Torr. & Gray var. THORNEI Reveal & Henrickson. Low spreading pulvinate subshrubs 0.4–1.0(–1.5) dm high, 1.0–3.5 (–4.4) dm across, from low woody caudices; lvs. linear, 4–6 mm long, white-tomentose below, finely villous and green above, revolute, narrowing gradually to a petiole 1–3 mm long; flowering stems herbaceous, leafy nearly throughout their length, 3–5 cm long, thinly pubescent; infl. compact, up to 2 cm long; invols. turbinate, 1.5–2.0 mm long, glabrous except for the apex, the 5 teeth acute, sessile or short peduncled; calyx white, becoming pinkish, 1.5–2.0 mm long, the outer segms. obovate with subcordate bases, the inner narrower, oblong, glabrous; aks. narrow, 2 mm long. Known only from W Fourth of July Canyon, New York Mts., 1810 m (5950 ft) elev., San Bernardino Co. July–Aug.

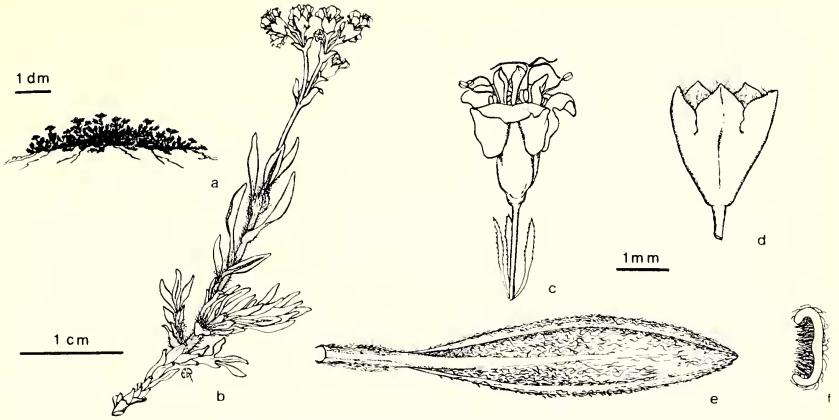

Fig 1. *Eriogonum ericifolium* var. *thornei*. a, habit. b, flowering shoot. c, flower with bractlets. d, involucre. e, leaf showing lower surface and clasping petiole base. f, cross section of leaf showing revolute margins. Magnification of c–f shown by mm scale.

The new taxon is very restricted in distribution, occurring only along 0.6 km of a northwest-southeast oriented ridge from 1871–1804 m (6140–5920 ft), and occupies a maximum area of less than one hectare. Although var. *thornei* is restricted to this ridge, it is notably abundant, and the area is marked by a conspicuous decrease in density and diversity of vegetation, as indicated in Table 1. Only *Pinus monophylla* shows little change in density on and around the site. However, the pinyons occurring with the new taxon were notably smaller (0.2–2.2 m high, average: 0.65 m) than those on adjacent slopes and ridges (0.2–5.6 m high, average: 1.3 m). The new variety often occurs in pure stands or mixed with *Eriogonum wrightii* var. *wrightii, Bouteloua gracilis, Allium nevadensis* var. *cristatum, Menodora scabra, Coryphantha vivipara* var. *rosea, Hymenopappus filifolius* var. *eriopodus* as well as species of *Astragalus, Cymopteris,* and *Caulanthus,* all of which also continued onto adjacent areas. Furthermore, the new taxon appears particularly well adapted to its habitat, as young plants are common especially in disturbed places as along a roadcut that traverses the site.

The greatly restricted occurrence of var. *thornei,* its local abundance, and the distinct change in vegetation around the site indicate that some edaphic factors may be involved in its limited distribution. Soil on the site is a rocky, sandy loam composed of a weathered quartz monzonite with fragments of vein quartz. Initial analysis of a soil sample collected under plants of the new taxon revealed a particularly high concentration of copper (312 ppm). Additional samples collected from two outlying populations of var. *thornei* had 236 and 176 ppm copper. One other site directly contiguous with that containing the variety, but covered with a nearly pure stand of *E. wrightii* var. *wrightii,* contained 138 ppm copper.

Table 1. Density in Number per Hectare of Major Trees and Shrubs over the Site with (Column A) and on Adjacent Areas without (Column B) Eriogonum ericifolium var. thornei. Measurements of *E. ericifolium* var. *thornei* and *E. wrightii* var. *wrightii* are based on sample of 67.3 m^2 with 61 × 61 cm (2 × 2 ft) quadrats. Density of other species is based on ten 0.004 ha (0.01 acre) samples. The density of *E. wrightii* var. *wrightii* was not measured (nm) outside the area occupied by var. *thornei*.

	A	B
Eriogonum ericifolium var. *thornei* Reveal & Henrickson	89,000	0
Eriogonum wrightii Torr. ex Benth. in DC. var. *wrightii*	61,000	nm
Pinus monophylla Torr. & Frem.	514	524
Echinocereus triglochidiatus var. *mohavensis* (Englem. & Bigel.) Benson	820	514
Opuntia erinacea var. *ursina* (Weber) Parish	1057	1877
Opuntia phaecantha cf. var. *major* Engelm.	30	326
Yucca baccata Torr. var. *baccata*	128	622
Juniperus osteosperma (Torr.) Little	....	217
Quercus turbinella Greene	....	296
Haplopappus linearifolium DC.	....	731
Gutierrezia microcephala (DC.) Gray	....	1491
Purshia glandulosa Curran	....	395
Ephedra viridis Cov.	....	119
Opuntia acanthocarpa Engelm. & Bigel.	....	30

Other immediately adjacent sites where the new variety did not occur had only 78, 19, and 4 ppm copper. The site furthermore contains several open pit diggings that showed the presence of shallow deposits of malachite and azurite. Thus, we believe, the distribution of var. *thornei* is strongly influenced by the distribution of copper bearing soils at this particular location. Fortunately the concentration of copper on the site is so low that commercial exploitation would not be feasible.

That copper may affect the distribution of plants is well known. Cannon (1971) discussed many facets of plant-soil relationships and listed species that have been noted as restricted to particular mineralized sites. This restriction, she noted, most commonly involves a tolerance of a particular compound that inhibits growth of other plants. She listed several species of *Eriogonum* that in some areas serve as indicators of gypsum, serpentine, and silver deposits. While this is the first reported incidence of a buckwheat showing restriction to a copper containing soil, similar edaphic relationships probably occur elsewhere in the genus and are important in determining the distribution of the numerous highly endemic species of *Eriogonum*.

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PRIMARY SUCCESSION ON GRANITE OUTCROPS IN THE MONTANE SOUTHERN SIERRA NEVADA

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Although primary succession has been widely studied, little attention has been given to its occurrence in the mountains of the western United States, despite the extensive distribution of rock outcrops. On the west slope of the Sierra Nevada, 29 percent of the total area above 1,543 m (5,000 ft) consists of rock or bare ground surfaces (Richards, 1959). This paper reports on general patterns of primary succession present on granite outcrops in the montane zone of the southern Sierra Nevada of California, including colonization by both cryptogams and vascular plants.

Much of the ecological literature on primary succession on rock surfaces (e.g., Cooper, 1913; Oosting and Anderson, 1937; Lawrence, 1958) have implied that primary succession progresses linearly from colonization by cryptogams, through herbaceous and shrub communities to an eventual climax forest community. Each later stage is dependent on physical and biotic changes brought about by the earlier stage. Recent studies in Hawaii on lava rock, however, have shown that a different progression can occur (Atkinson, 1970). *Metrosideros collina* (ohia) is the dominant climax forest species on incipiently weathered lava and is also one of the first colonizers on sterile outcrops. While cryptogamic communities may become established more rapidly, they have little significance in the establishment of *Metrosideros* seedlings within crevices on the lava outcrops.

Primary succession on granite outcrops in the montane southern Sierra Nevada shows a pattern similar to that described for *Metrosideros* in Hawaii. Climax woody species appear early in the successful development of the outcrops, with little influence of cryptogamic or herbaceous com-